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THE CHEMISTRY AND MECHANICS OF COIN HOUSING

G.A. Mooney January 1963

I am grateful for the specific nature of this subject! Just think of the things that we do not have to consider.

Currency and its many ramifications.
Encased Postage Stamps, as interesting as they are.
Medallions, tokens, medals and their metals.
The housing of Indian Wampum and trade tobaccoes.
The "madness" of modern prices!

...And I choose to completely sidestep the subject of coin cleaning on the grounds that it does not come within the scope of housing (even though some of the cleaning contaminates will probably also be neatly housed).

The chemistry of coin housing is about as general as the chemistry of love - and just as complex. Consider the area of discussion:

Materials to be housed range from:
- Gold to Glass
- Silver to Salt
- Bone to Bronze
- Porcelain to Platinum
- Steel to Stone
- Leather to Lead
- ...And A to Z!
- (Aluminum to Zinc).

Conditions range from:
- Handling to Humidity
- Atmosphere to Dropping Fear
- Factory Fumes to Basement Rooms
- Temperature to Temperament
- Acidity to Stupidity
- Telling to Selling
- ...And Staples to Styrafoam

Barriers range from:
- Gloves to Glue
- Silicones to Nail Polish
- Scotch Tape to Acetate
- Vaseline to Polyethylene
- Wallets to Wall Safes
- Paper to Petroleum
- Drawers to Bars
- ...And Encasement to Embedment

Housings range from:
- Cupboard to Cabinet
- Cardboard to Hardboard
- Frame to Dame
- Pasteboard to Plastic
- Baby Shoes to 2 x 2's
- Velvet Box to Plastic Blocks
- Sliding Trays to Lacquer Glaze
- Pockets to Packets
- Bags to Books
- ...And Vellum to Vaults

As Mark Twain might have put it: It depends on what one wants to protect show or arrange, how much protection, show or arrangement he wants, for how long he wants it, from what he wants the protection, the reliability of the protection chosen, his ability or willingness to pay the price, and his stamina for resisting the shock when the final invoice, in terms of treasure, time, and temper, becomes apparent.

COMPOSITION OF COINAGE

Starting with what one wants to house brings us to the chemistry or metallurgy of coinage. For 25 centruies - from about 700 B.C. to the middle of the 19th century - four metals in varying combinations and proportions, formed the basis of the world's coinage systems. They were copper, gold, silver and iron. (1). It was not until 1850 that the Swiss developed an alloy of about 62% copper, 23% zinc and 15% nickel (2), and the pandora box of metals was opened to coiners.

That is not to say that the ancients were crude or unintelligent. They were well acquainted with the art of refining and of alloying metals. Persian darics were .958 to .970 fine. Staters of Philip and Alexander were .997 fine, Roman Republican coins were very pure. The Aurai of Augustus were .998. Roman Empire coins only began to lose their purity toward the time of Septimus Severus. The gold coinage of the Bosporus under the Roman Empire became rapidly debased, and after the time of Severus Alexander, was practically mere copper with only a tinge of gold (3).

Going back even further, cupro-nickel alloys, containing approximately 80% copper and 10% to 20% nickel, were used for coins in Bactria in 170 B.C. (4). As we will see later, the United States in 1857 made its first regular issue nickel-bearing coin, a one-cent piece made of an alloy of 88% copper and 12% nickel (5). Nine years later, in 1886, it adopted an alloy of 75% copper and 25% nickel (6).

UNITED STATES COINS

Because of the sheer magnature of the subject, consideration here will be restricted to the regular coinage of the United States. However, most of the points covered will apply to coins of all description.

Table I "Composition of United States Coinage" shows nine of the elements used in quantities of greater than .1% (copper, zinc, tin, nickel, silver, manganese, gold, iron, and carbon). The carbon and iron are combined in steel, the copper and zinc in brass, and the copper and tin in bronze.

At this point a question is posed. What was the 10th element, not shown on the table, associated with a United States coin? Consider that one awhile!

You will note that all U.S. coinage alloys may be broadly grouped into five categories - the coppers, zinc coated steel, silvers, nickels, and gold. Each has its chemical and mechanical enemies. These, together with what to watch out for, and suggested methods of housing are shown to the right. In developing this table I ran across four items that I thought particularly interesting:

1. Shortly after the large cents were replaced with a smaller size, this item appeared in the Weekly Richmond (Va) Enquirer. (June 17, 1857). "There have been several cases in New York where the new cent has been swallowed by children, and in which great irritation of the stomach and the bowels have followed, because of the corrosive material of the metal composing it as well as of the mechanical action upon the delicate mucous surfaces". (Underlining added).

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(1) Coin World April 13, 1962
(2) In recent years more than 5 million pounds are used annually for coinage or about 1% of the world's consumption for all purposes. Coin World April 13, 1962.
(3) Handbook of Greek and Roman Coins, G.F. Hill, 1899. England adopted the 916.6 gold standard in 1526. France adopted the 900 standard for both gold and silver soon after the French Revolution. Source: A Brief History Coin Production, Cmdr. R.E. Stark, USN.
(4) Numismatist, May 1960, p. 572.
(5) Numismatist, May 1960, p. 580.
(6) Numismatist, June 1960, p. 719.

2. You are problably familiar with the fact that in the years 1944 and 1945, cents were made from ammunition cases salvaged from the War. (World War II). However, you may not be familiar with the fact that in 1961 coins were made into ammunication cases. The following dispatch is from Saigon, South Vietnam, dated July 20, 1961. "Officials said Communistic Viet Cong Forces are using French money to make ammunition. They said shotgun cartridges were made from brass tubing with old French coins molded to one end as a base and rim".

3. Almost everyone knows that large quantities of the 1943 zinc coated steel cents were produced. Actually there were 1,093,838,670 from the three Mints. Most people also know of their perishability. However, beginning in May 1959, a program of disposal was started. The Alan Wood Steel Company of Conshocken, Pa., melted down 13,500 lbs. of the cents. This accounted for more than 1,250,000 cents. The company was allowed to keep the steel in payment for getting rid of them. (1).

4. In the early days of the West, many a $5.00 or $10.00 gold piece was hammered into shape on a ranch anvil, because cowpunchers wanted crown or bridgework. "Coins minted from California gold were best for this purpose because the metal held its color well. Black Hills gold always showed the copper and stained badly in a tobacco chewer's mouth". (Underlining added). (2).

PURPOSE & OBJECTIVES

Now that we have surveyed what we wish to house and some things to watch out for, the matter of housing is at hand. Consideration must be given at this point as to the purpose of the housing!

Is it to protect the coins only? Perhaps a hermetically sealed container in a Bank Vault is the answer.
Is it to offer maximum availability? Perhaps for research - or sale?
How durable should it be? Fort Knox or a pocket container?
How portable must it be?
Is it to offer maximum visability?
Is it to please someone? Perhaps jewelry is the answer.
Is identification at a glance important?
Is associated information important? This can range from a mintage figure to great museum displays.
Is space conservation the objective? Large collections can be a problem.
Is price a consideration? A building or a board?
Is flexability important? A system's requirements may change as a collection grows or contracts.

It is interesting to note the change in exhibit judging standards over the years. (See Table II). Condition, value and completeness have increased in importance while information provided, arrangement or eye appeal, and originality have declined - a sad trend from the standpoint of the true numismatist seeking knowledge and wishing to pass it on to others.

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(1) Coin Collector, May 1959 and Numismatist June 1959, p. 663.
(2) Collector clipping - date unknown.

THE FRIGHTENING FIVE

I have listed in Table III what might be called "The Frightening Five" - the things to guard against insofar as practicability will permit.

Losses can be insured against in several ways - by knowledge, carefulness, precaution, alarm systems, insurance within limits, investigation and evaluation. Just as with any insurance however the amount of the "premium" you are willing to pay, must be evaluated along with the risks you are willing to take. Your evaluation of "probability" plays a great part in this evaluation. Incidentally, there was a fine article on the subject of coin insurance by Mr. Hub Strain, in the November 16, 1962 issue of Coin World.

Mutilation can be minimized by carefulness, common sense, and physical protection. Keeping collections out of reach of children (of all ages) is wise. Handling coins over a rugged area or blottered desk is another precaution. Experimenting with cleaners and preservatives on little valued coins is another.

Abrasion comes down pretty much to common sense. Everyone should know that rough or thoughtless handling will result in detraction from a coin's quality or value, yet I am continually amazed by the nonchalance with which some people, including "old-timers", handle coins - theirs and others!

(Of course at this point we return for a moment to the purpose of the housing. I read where collectors in Latin America usually keep their coins in a box or canvas bag and get pleasure from the sound of them banging together. The advanced collector there often glues them very securely on a wooden board.)

Adhesion in itself is not usually too serious - but it can lead to things quite serious. In the first place these substances detract from the appearance of a coin. In the second place they can lead to abrasion, corrosion, or even mutilation.

Corrosion is a subject unto itself. So many conditions are involved that it is difficult to generalize on it except in the case of moisture prevention, and even in that area high gold content alloy is a practical exception.

PREPARATION

There are of course several schools of thought on preparing a coin for housing. Without getting into the merits, demerits, and methods of cleaning preparatory to housing, it is interesting to view these schools of thought with respect to corrosion.

There are the clean-everything advocates. They usually maintain that:

1. Tarnish is merely corrosion in its early stages.
2. The problem is to not house or enclose corrosion or corrosion-producing elements with a coin.
3. Knowledgeable preparation for housing (cleaning) does practically no harm to a coin and can improve its beauty, potential life, and value.

4. We all can't have brilliant, uncirculated coins and therefore should improve and protect those circulated coins that we have.
5. If you do not prescribe to the above, you may have a shocking surprise when you view coins you have stored for sometime.

Then there are the never-clean-a coin advocates. They usually maintain that:

1. Probably the best chemical protection a coin has is its natural oxidation, apparent by its coloring, toning or texture.
2. The problem is to keep it that way - to stop or slow down that chemical reaction.
3. Many so-called "protectors" will, in fact, speed it up. Others will introduce new corrosive elements. And still others, will physically damage the coin.

Then there are the "middle-of-the-roaders", the "compromisers", the "sly ones" and the "scourers". I think you can humorously visualize individuals in each of these groups.

CORROSION

Corrosion is the destruction of metal by chemical or electrochemical action. This sounds terrible but it is not necessarily so. Except in the case of ~~some~~ gold Some gold~~,~~ minute destruction probably occurs the moment the die leaves the coin and allows air to contact the bare unoxidized metal.

Purely chemical corrosion starts rapidly but slows as soon as an undisturbed, obstructive layer of corrosion product has been formed upon the metalic surface - sometimes before the film has attained visible thickness. If this layer is disturbed or is continually being cracked by bending, abrasion, removal or other mechanical operation, corrosion will continue unchecked at its original rapid rate.

It is also worth noting that many collectors prefer their coins to have a slight tarnish or tinge. They feel that it brings out highlights, adds just enough color, and otherwise enhances the artistry of the designer. This is another indication of the tremendous variety of tastes in coin collecting. What is attractive to one collector may appear to be a blemish to another.

PITTING

Pitting is usually the result of local cell action, most commonly the oxygen cell. This cell arises from the presence of foreign objects or debris on the metal surface (such as specs of dirt or scale) which causes an oxygen deficiency at the point of coverage. Where this is disturbed the current which passes from the coin as cathode to the spec of debris as anode is intensified by the fact that the anode is small compared to the cathode, and the relatively large amount of oxygen now reaching the cathode. This action results in the transformation of coin material into corrosive compounds and the precipitation of these products as a blister at or near the anode (spec) leaving a pit in the cathode (coin). This causes further disturbances of corrosion product and the cycle repeats.

In some cases the presence of debris is unnecessary for electrochemical action. Some coins will at the outset develop numerous anodic and cathodic areas interspersed all over the surface, owing to local chemical or physical differences in or on the metal. In this connection consider the processing of the metal as it becomes a coin. It is melted, alloyed, moulded, rolled, annealed, punched, treated, washed, etched, rinsed and struck. This, along with subsequent handling, certainly provides for the possibility of retained contaminates.

DEZINCIFICATION

Many copper-zinc alloy coins such as the United States cent since 1864 corrode in part by a process called dezincification. There are two schools of thought as to how the zinc at the surface is lost but the end result is the same: the copper is left in a pourous, unpleasant looking layer. One school of thought is that both copper and zinc is dissolved or leached from the coin and the copper is immediately redeposited. The other thought is that the zinc atoms are leached directly from the metallic crystal lattice, leaving the copper atoms essentially in their original positions.

The key words in the foregoing are "dissolved" and "leached". Stagnent or slow moving solutions such as contaminated condensation can do the trick.

Incidentally, where tin is present in a copper-zinc alloy, it contributes in a significant manner to improved corrosion behavior. The chief improvement corrosion-wise is the impediment to dezincification. Now, you probably know that until the week of September 10, 1962, some tin was used in the cent alloy. Now that tinless cents are being produced it will be interesting to observe in the years to come if dezincification of our cents will appreciably increase. The mints position is apparently that it will not since such small amounts of tin have heretofore been used and no doubt laboratory tests support this conclusion. Nevertheless one can recall similar theories with respect to the zinc coated steel cents of 1943.

STRESS & INTERCRYSTALLINE CORROSIONS

Stress corrosion occurs when the metal is in a stressed condition (coining) in a suitable corrosive atmosphere. In the case of copper alloys this atmosphere is usually ammonia, carbon dioxide, or similar nitrogen compound plus moisture and oxygen.

Intercrystalline corrosion is similar to stress corrosion without the stress and is pretty much confined to interaction between crystals of the metal. Nevertheless the metal is penetrated along its grain boundaries.

Corrosion-Fatigue cracking is evidenced by cracks which originate at a surface roughened by corrosion. The roughening of the metal surface leads to concentrations of the dynamic stresses and thus to the propogation of fatigue cracks.

With all of these forces acting to destroy a coin it may appear miraculous that any coins survive. With the air we breathe containing eleven gaseous constituants exclusive of water vapor, with normal sea water containing sixty properties in solution, exclusive of dissolved gasses, and the earth's crust containing eighty elements, it would appear that a coin on this earth doesn't have a chance!

Actually, these corrosive forces are minutely small. Many of them are selfcontrolling. Others can be controlled or checked. Others prevented. Some ignored. And some of them prevent others from occurring and are therefore downright benficial.

HOUSING MATERIALS

Now that we have objectively viewed what it is that we wish to house, and what we want to protect against, let us look at what is available in the way of materials. I believe this subject is best summed up by an editorial in the October 16, 1961 issue of the Numismatic News and which is quoted in part, with their permission:

"Coin collecting has come a long way since the first struggling efforts of the numismatic pioneer.

"It is more than likely that he had neither a way to display his coins nor a group of friends interested enough to come over and see the coins he had.

"He had no bank in which he could deposit his most valuable pieces for safe-keeping and the coins he kept at home probably had to be kept in a makeshift filing system in a homemade cabinet.

"Collecting has come a long way since then.

"Today the collector who cares about his coins can care for them in almost every way the early collector could not.

"The collector can buy coin albums for displaying his collection.

"He can chose a simple folder which will unfold into a long, open-faced display card in which all the coins contained are visible at once.

"These folders come in a variety of sizes and are designed for the whole gamut of American coins and for many foreign coins as well."

ALBUMS

"Also available are album binders so that the collector can build his own album with loose-leaf sheets of coin holders. He can purchase the binders and sheets in a large number of sizes, with or without labels for specific coins.

"For the collector with a little more interest in the external aspect of collecting, there is the type of album which is built like a book. The pages open as book pages and the binding is of sufficient quality that the collector need not be ashamed to display it alongside the finest book in his library.

"There are also pocket-sized albums, designed to be carried and stored comfortably and easily. There are ringed, loose-leaf binders and plastic display sheets in several sizes".

DISPLAY CARDS

"But albums and books are not the only display and storage facilities open to the collector. If he chooses, he can use plastic coin display cards in a wide range of styles. He can buy cards which will display cents, dimes, half-dollars; in fact, the whole area of American coins through commemoratives - and the coins will be clearly visible from both sides.

"Some of the book-like albums even contain background information on the coins, giving both beginner and the experienced collector a source of interesting and helpful information.

"There are heavy plastic coin holders which some collectors find useful. These can be used in a variety of situations. When a collector has a single coin which he displays frequently, he may find it to his advantage to place it in a heavy plastic holder.

HOLDERS

"There are holders for a single coin and holders for a number of coins. Holders for proof sets and for type sets as well as holders for medals.

"Some of these holders are held together by plastic or metal screws, some are hinged and open and closed by a device similar to that on a woman's purse.

"If the collector prefers he can mount his single coins in 'visuals' rather than in plastic holders.

"These folding display cards also come in several sizes and neatly display the coin through plastic on both sides, being surrounded by a heavy pasteboard frame.

"And in the same store where he buys the visuals, the collector probably can purchase the stapler with which he can fasten them closed."

ENVELOPES

"Many collectors want their specimens stored individually but more easily accessible. Consequently these people prefer the individual coin envelopes.

"These envelopes are made of several materials and come in a number of sizes. Some are made of polyethylene and will hold coins of very small diameter.

"There are also envelopes of heavy and light paper and cellophane.

"To satisfy still another desire of the collector, manufacturers and suppliers have made available the clear, heavy plastic coin tube and with it the caddy to carry the tubes in.

"Some collectors prefer the display and storage method which is most common in Europe--that of filing in open faced drawers in small cabinets."

CABINETS

"Here again the field is wide open to the collector. He will be able to obtain an assortment of sizes of cabinets with varying kinds and sizes of drawers. He can also buy cards with holes to lay in the drawers for the purpose of filing coins. These cards too cover nearly the whole range of U.S. collecting.

"Similar to cabinets are the wide variety of coin chests. These are available in several sizes and shapes, and come in different colors and finishes. Some hold rolls, some hold small file drawers for coin envelopes or visuals.

"There are embedments, that is, coins embedded in clear plastic. These include paper weights, bottle openers, key rings, letter openers and what have you."

JEWELRY

"Jewelry can also be obtained in the form of coin bracelets and earrings, some of them gold plated. For the men there are coin sets of cuff links and tie clasps.

"Today's collector is in a position unique in the world's history. He has more time to enjoy his hobby than ever before and though most of us have a dozen proofs to refute this, today's collector has more money which he can use on his hobby.

"And, thanks to manufacturing and suppliers, today's numismatist has a wide-open field for the advancement of his hobby through the marvels of today's manufacturing and merchandising".

* * *

While the devices are for the most part beautiful, timesaving, and convenient, there are those of us who desire to also "invent" our own. I do not recommend this pastime if time is of any great value or if the collection is large. But I do recommend it as rewarding to those who have the time, ability, ingenuity and desire to express individuality or taste, to suit some particular set of requirements, or simply to explore the practicality of new ideas.

COMMENTS ON MATERIALS

I would also add that while these devices have their place in coin housing, they are not necessarily good for the coins under certain circumstances. I have therefore attempted to correlate data on the more common materials often recommended for coin housing and have condensed it in Table IV.

Although we are considering the housing of coin, as a sidelight it is interesting to note that coins have been used as housing for other things. For example, coins have been hollowed out and used for the transmission of microfilm and other espionage information as in the Colonel Rudolph Evanovich Abel case. Another example is the precision timepiece housed in a $20.00 gold piece currently being offered at $660. (tax included). (1).

SUMMARY

With all of these do's, dont's, cautious and qualifications only on U.S. coinage, one might at this point ask: "Is there a simple answer to housing?" The theoretical answer is "no" because most metal coins oxidize to some extent shortly after they leave the die, and housing desires are as varied as individuals.

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(1) Simons, 510 So. 16th Street, Omaha, Nebraska.

Practically, there is a simple answer: Any container is good if:

1) It is inert.
2) It houses uncontaminated coin.
3) It is well sealed against:
    a) moisture
    b) air
    c) gasses
    d) radiation
4) It is kept at a relatively uniform temperature.
5) It is kept physically safe.
6) It is economical.
7) It pleases.

Seldom will these factors be compatable with one's specifications or means, in which case compromise must be resorted to. Exhibit V exemplifies this point.

In my own case, I keep valuable pieces and those of an investment nature wrapped or tubed and sealed in polyethylene, stored in a local bank vault, and periodically inspected.

For the active portion of the collection I have a small den with walls, ceiling and floor of concrete. It is relatively dry. Portals are alarmed. Floor is rugged. Temperature is independently and automatically controlled. It is paneled and comfortable but not elaborate.

The coins themselves may be divided into three groups. The finest or those I want to protect the most are encased in airtight, snug-fitting telescoping ethylcellulose wafers. Those in the second group are encased in sealed holders which are inserted in either vinyl pages or small frames of my own design, thereby permitting complete viewing, replacement or rearrangement. Those in the third group either do not in my opinion justify the expense of inert holders, or are awaiting study and encasement. They are in either their original containers or in small polyethylene-lined cardboard boxes.

These various containers are stored in converted Kardex file drawers and in a wooden coin cabinet. In each set of drawers and in the cabinet is an inexpensive Silica Gel air dryer. This latter feature, is, I believe, very important and accounts in great part for the success I have had in protecting, yet handling the coins.

You will no doubt note that this setup is not in every respect consistant with all of the objectives, methods, and precautions mentioned earlier. However, it is the balance I have struck for my objectives and which, for the most part has been relatively successful.

CONCLUSION

Your collection, whether great or small, voluminous or scant, specialized or general, is treasure. Perhaps its value to you is more sentimental than monetary. Perhaps its value is greater to someone else than it is to you. In any event, the setting for it can change the pride or desire or possession to a marked degree.

The embellishment of treasure has been a pastime for centuries. The framing of pictures is a good example. Why? To protect, to please, to tie-in a title, to add attractiveness, value or charm.

It's time-consuming and at times exasperating, but attractive systematising has its rewards in using one's own imagination, ingenuity, time, tools and temperament - and can lead to research and its reward of enchantment and pleasure.

* * *

Have you thought of the 10th element associated with United States coinage - the element in addition to Copper, Zinc, Tin, Nickel, Iron, Silver, Manganese, Gold and Carbon? Surely you have heard of the Mercury dime!

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TABLE I

COMPOSITION OF UNITED STATES COINAGE

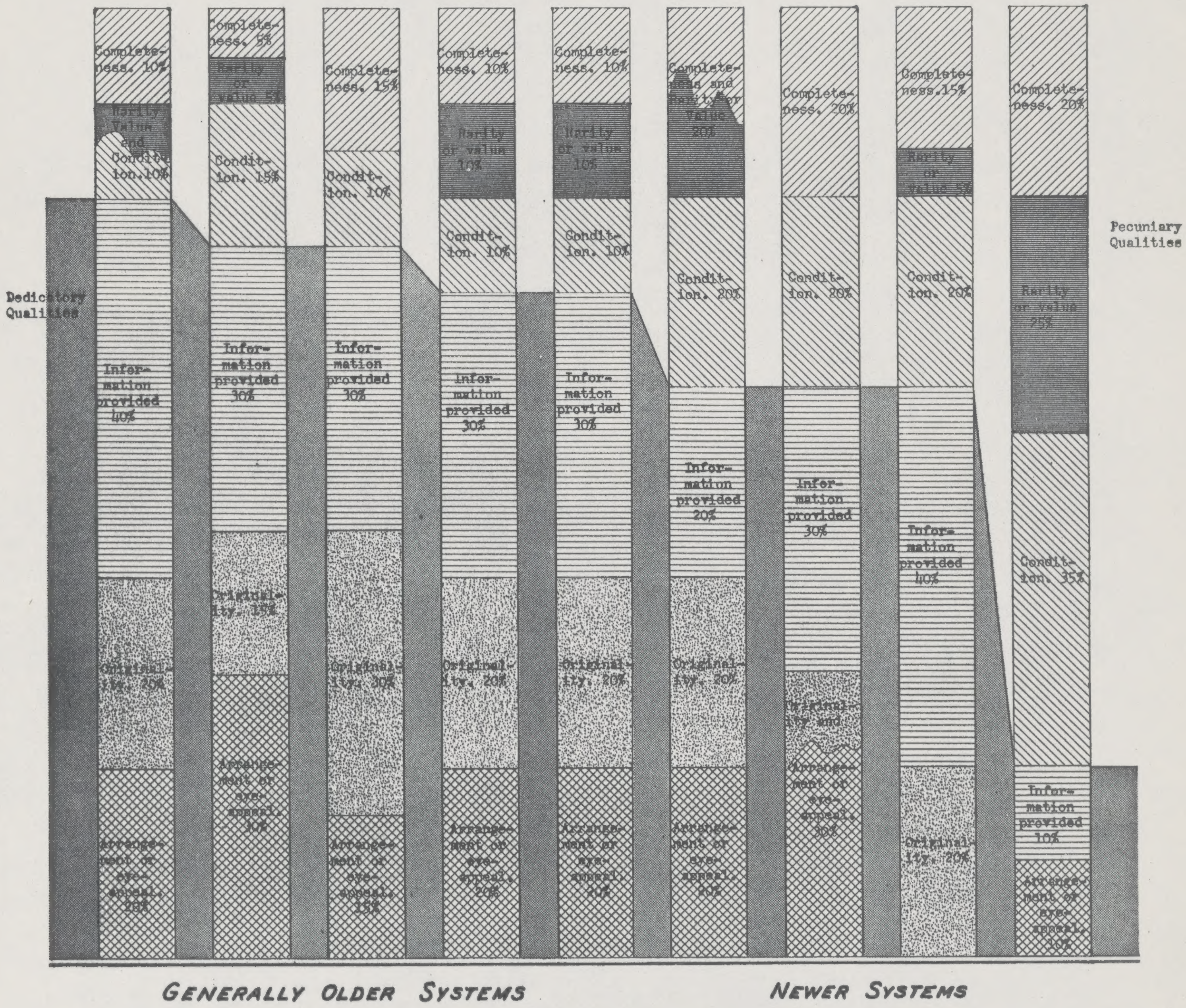
(Excluding strikings on off-metals, patterns, trial pieces, commemoratives,)
(Medals, coinage for other governments, and minor impurities of less than 1/10th of 1%)

Alloys do not always take on the characteristics of their components nor are they affected by the same influences which affect their components.

Denom	Type	Years	Cu Copper	Zn Zinc	Sn Tin	Ni Nickel	Fe+ Steel	Ag Silver	Mg Mang.	Au Gold	C Carbon	Chemical Enemies	Mechanical Enemies	Watch Out For	Consider Using	Refer. & Notes
½¢	Initial	1793-1797	Scrap									Oxygen	Wear and	Moisture Traps	Moisture-	(2)
	Early	1800-1807*	Purer									(Cu-Oxide)	handling	(Even though	absorbant	(3)
	Intermediate	1808-1811	Soft									Sulphur	←(very soft)	containers	bags of	(4)
	Later Date	1825-1857*	Hard									(Cu-Sulphide)	"Clinking" to-	are inert).	pellets that	(5)
												Ammonia	gether in	Electrolysis	can be baked	
1¢	Initial, Large	1793-1796	Scrap									(Blackens Cu)	folders or	(Battery Act)	out and	(2)
	Early, Large	1796-1807	Purer									Acids	loose in bags	Coal Gas	reused.	(3)
	Intermediate	1808-1814	Soft									(Including)	←(very soft)	Furnace Fumes.	Inert plastic	(4)
	Later Dt. Lg.	1816-1857	Hard									(perspiration)		Petroleum (Oils	containers	(5)
	Flying Eagle	1856-1858	88%			12%						Caustics	Heat (Catalyzes	and greases)	Sulphur-free	(6)P10
	Indian	1859-1864	88%			12%						Tars	most chemical	Rubber	paper	(6)P10
	"	1864-1909	95%		5%							.. and their	reactions)	Paper Holders	wrappers	Brz.
	Lincoln	1909-1942	95%		5%							compounds.	Variable Temp-	Wrappers and	and tissues	"
	"	1943		Clad			Core				.25%	+Zinc Oxide	erature	cardboards	Rice Paper	(9)P974
	"	1944-1945@	70%	30%									(may promote	Glue	is usually	Brs(11)
	"	1946-1962	95%		5%							Chlorides	condensation)	Inks & Pigments	sulphur-	Brz(12)
	"	1962-(14)	95%	5%								Sulphides	Grit (sun and	"Tarnish-proof"	free. (15)	Brs(11)
												Iodine	weather	tissue	Careful re-	
2¢	Two Cent Pc.	1864-1873	95%		5%							Mercury	treatment)	(The above	moval of	Brz(12)
													cleaning	often contain	potentially	
3¢	Silver	1851-1853	25%					75%					erasers	significant	contaminating	(6)P98
	"	1854-1873	10%					90%					scratches	amounts of	materials	
	Nickel	1865-1889	75%			25%							Dirty Cloths	sulphur)	from coins.	(8)P12
												Nitric Acid	Dropping		Sealed conta-	
															iners	
5¢	Half Dime	1794-1837*	10.76%					89.24%				Hydrogen		Staples (They		(6)P99
	" "	1837-1873	10%					90%				Sulphide	Sliding	rust)	Bank Vault or	(6)P99
	Nickel	1866-1942*	75%			25%							Electrolysis	Dandruff (Fatty	alarm system	(8)P12
	Silver (13)	1942-1945	56%					35%	9%				+Soft	acid)	for physical	(8)P12
	Post War	1946-	75%			25%								Enclosing	protection	(8)P26
														contaminating		
												Sulphur	Water (contains	elements	Periodic	
10¢	Dime	1796-1837*	10.76%					89.24%				(Ag-Sulphide)	oxygen and	with coins	inspections	(6)P99
		1837- *	10%					90%				Nitrates	other impur-		Gloves for	(8)P11
												(Ag-Nitrate)	ities in	Leaving rolls	handling	
20¢	Twenty Cents	1875-1878	10%					90%				Acids (partic-	suspension &	in bank		(8)P11
												ularily Nitric)	solution.)	wrappers.		
25¢	Quarters	1796-1837*	10.76%					89.24%				Acidic Cleaners				(6)P7
	"	1837- *	10%					90%				Chlorides	Physical con-			(8)P11
													tact with			
50¢	Halves	1794-1837*	10.76%					89.24%					materials			(6)P7
	"	1837- *	10%					90%					containing			(8)P11
													sulphur			
$1.00	Silver Dols.	1794-1803	10.76%					89.24%								(6)P7
	" "	1840- *	10%					90%								(8)P11
	Gold Dols.	1849-1889	10%							90%		Two acids,	Wear and	Mishandling	Soft plastic	(8)P6
												nitric and	handling	Dropping	containers.	
$2.50	Qtr. Eagles	1796-1834*	8.34%							91.66%		hydrochloric,	(Coin gold is	Sliding	(Perhaps	(8)P6
	" "	1834-1837	11.08%							89.92%		when combined	a relatively	Cleaning	inside an	(8)P6
	" "	1837-1929*	10%							90%		as Aqua Regia	soft alloy)		outer cover)	(8)P6
												will dissolve	"Clinking"	Trusting others	Careful removal	
$3.00	Three, Gold	1854-1889								90%		gold	together in	to use good	of surface	(8)P6
													folders or	judgment.	dirt or film.	
$5.00	Half Eagles	1795-1834*	8.34%							91.66%		Mercury and	loose in same		Periodic	(8)P6
	" "	1834-1837	11.08%							89.92%		its compounds	container.		inspection	(8)P6
	" "	1837-1929*	10%							90%		will readily	Grit		Bank vault or	(8)P6
												combine	Cleaning		alarm system	
$10.00	Eagles	1795-1804*	8.34%							91.66%		with gold.	Erasers		for physical	(8)P6
	"	1838-1933*	10%							90%			Scratches		protection.	(8)P6
												Tobacco juice	Dirty Cloths			
$20.00	Dbl. Eagles	1849-1933*	10%							90%		(10)				(8)P6

NOTES:
- * Not coined every year between dates shown.
- (2) Variable in assay, color, and hardness (made from copper nails, sheets, kitchen utinsels such as kettles and tongs, salvage from wrecked ships, and scrap of all kinds). Half Cents are assumed to be of same composition as large cents of the same period. Source: W. H. Sheldon, Penny Whimsey, p.11.
- (3) Fewer impurities than before but still contains some. This is concluded from hardness tests and same assumptions as above. Source: "Coin Collector", 1961.
- (4) Relatively pure copper. Probably over-annealed to provide "dead" softness to prolong the life of the dies. Same assumptions as above. Source: R. S. Yoeman "A Guide Book of Unitead States Coins". 16th edition p.11.
- (5) Harder copper. Probably purer and more properly annealed than in previous years. Source: "Coin Collector", 1961.
- (6) R. S. Yoeman "A Guide Book of United States Coins". 16th Edition.
- @ Shell cases salvaged from the war (WW II). Source: "Coins and Currency of the United States" p.12. Also Numismatic News 10/15/62
- (8) "Coins and Currency of the United States". Office of the Secretary of Treasury, June 30, 1947.
- (9) Webster's Collegiate Dictionary - Fifth Edition.
- (10) In the early days of the West many a $5 or $10 gold piece was hammered into shape on a ranch anvil because cowpunchers wanted crowns or bridgework. Coins minted from California gold were best for this purpose because the metal held its color well. Black Hills gold always showed the copper and stained badly in a tobacco chewer's mouth. Source: "Coin Collector".
- (11) Brass: Basically copper and zinc.
- (12) Bronze: Basically copper and tin.
- (13) Title XII of the Second War Powers Act of Mar. 27, 1942 authorized the use of silver. Used from Oct. 1, 1942 to Dec. 31, 1945.
- (14) From Sept. 10, 1962 on. "Coin Collector", Oct. 20, 1962.
- (15) Rice paper is sulphur free. "Coin Collector", Oct. 20, 1959.

STANDARDS FOR JUDGING EXHIBITS



Notes: 1) Some older systems are still used.

2) Identification of plans by organization or individual has been intentionally omitted.

3) Plans 4 and 5, although apparently identical, are different in some minor connotations and were therefore both included.

4) Exact wordings used above are not always those of the using organization. However, effort was made not to change general meanings.

TABLE III

THE FRIGHTENING FIVE

Loss	Theft	Robbery - subterfuge - swindle.
	Accident	Unnoticed slippage - shipping losses.
	Misplacement	Misfiling - erronious abandonment.
	Confiscation	Title questions - inflation - counterfeiting - Gov't. action.
Mutilation	Ignorance	Children - acid - carelessness - jewelry.
	Accident	Drops - dents - dinges - spills.
	Disaster	Fire - flood - storm - wreck.
Abrasion	Wear	Circulation - vending machines - rollers.
	Handling	Bag niches - finger prints - perspiration.
	Cleaning	Harsh brushing - acid pitting - grinding.
Adhesion	Dirt	Dust - tars - finger oils.
	Gums	Tapes - glues - varnish - wax.
Corrosion	Tarnish	Air - fumes - dampness.
	Deep Chemical	Impurities in contact.
	Electrolytic	Moisture - salinity.

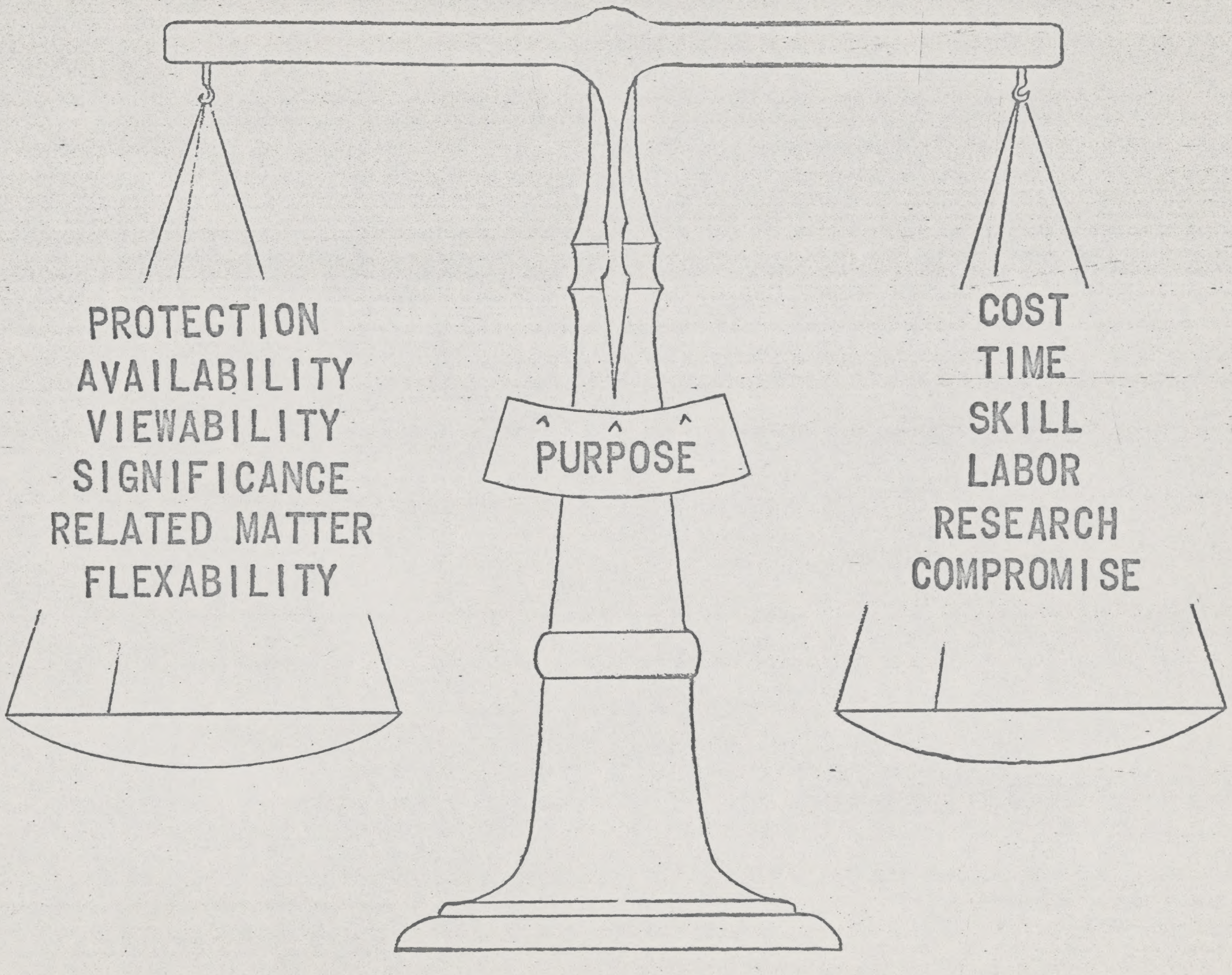
TABLE IV

CORRELATED COMMENTS ON MATERIALS SOMETIMES RECOMMENDED FOR COIN HOUSING

(The terms "safe", "doubtful", and "harmful" are all relative, depending on many conditions such as seal,)
(time, temperature, humidity, atmosphere, contaminates on coins being housed, alloy, and perhaps others.)

	Safe	Doubtful	Harmful	Comments
PAPERS AND CARDBOARD		X		Depends on sulphur content and seal from air and moisture.
Kraft Envelopes			X	Personal observation ower period of time. Short exposure is safe.
Tarnish proof tissues		X		Only sulphur free paper is safe.
Cardboard holders or boxes		X		Depends on sulphur content, time, contact and air seal, if any.
Bank Wrappers			X	Have been found to contain 5% sulphur.
PLASTICS		X		Depends on type of plastic, exposure, contact, time and seal
Ethylcellulose	X			
Polystyrene	X			
Polyethylene (petrothene)	X			These are inert. They contain no oxygen nor are they affected by oxygen.
Combinations of above	X			
Derivations of the above	X			
Plexiglass		X		Contains polymethacrylic acid.
Cellophane		X	X	Contains some degree of nitrate and sulphur. Long exposure is harmful.
Vinyl *		X		Will combine with oxygen, forms new chemical which attacks metal.
Chlorides *			X	Yield hydrochloric acid vapor which will tarnish and then corrode.
Butyrate			X	Very volatile.
Acetate *		X		Volatile. Short time exposure is safe.
Combinations of *			X	Same reasons as above.
Butyrate-acetate			X	Volatile
Mint plastics		X		See Mint Materials below.
BANK MATERIALS		X		Generally chosen for expediency.
Bank Wrappers			X	Have been found to contain 5% sulphur
Wrapping machine greases		X		Many greases and oils contain a high degree of sulphur.
Bag dust			X	Has been found to be catalytic if not removed.
Envelopes			X	Usually contain some sulphur.
MINT MATERIALS		X		Depends on method of housing, time and other considerations.
Proof set plastic through 1954			X	Staples corrode. Cellophane contains sulphur and nitrate approx. 5%.
Proof set pl.'55 & 1st.Qtr.'56	X			Inert polythethylene.
Proof set pl. Last 3 Qtrs. '56.			X	Cellophane, containing sulphur and nitrate was again used.
Proof set plastic 1957 on	X			Polyethylene clad cellophane, but 1 mil cladding is doubtful.
Mint set cardboard and paper			X	Contains some sulphur.Depends on time & quality of air seal, if any.
ROLL HOUSING MATERIALS		X		Depends on materials used.
Aluminum foil			X	Subject to aluminum oxide tarnish.
Plastic tubes		X		Depends on type of plastic used. See "Plastics" above.
Scotch type tape			X	Becomes messy with age. Some are volatile, others sulphurous.
Airplane cement			X	Contains volatile solvents.
Bank Wrappers			X	Have been found to contain 5% sulphur.

TABLE V


PROTECTION
AVAILABILITY
VIEWABILITY
SIGNIFICANCE
RELATED MATTER
FLEXABILITY
PURPOSE
COST
TIME
SKILL
LABOR
RESEARCH
COMPROMISE